

PATENT
Atty. Dkt. No. AMAT/5008/CPH/JPJS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Yoshidome, et al.

Serial No.: 09/991,317

Filed: November 21, 2001

For: Piezoelectric Vaporizer

§§ Group Art Unit: 1763
§§
§§ Examiner: MacArthur, Sylvia
§§
§§ Confirmation No.: 5107MAIL STOP AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450CERTIFICATE OF FACSIMILE
TRANSMISSION UNDER 37 CFR 1.8

I hereby certify that this correspondence and the documents referred to as attached therein are being facsimile transmitted to the U.S. Patent and Trademark Office to the fax number indicated by the Examiner, namely, fax number 703-672-9308 to the attention of the named Examiner, on the date below.

3/14/05
Date SignatureDECLARATION UNDER 37 C.F.R. § 1.131

We, the undersigned inventors, Ted G. Yoshidome and Joel M. Huston, hereby declare as follows:

1. Attached is an invention alert (Exhibit A) dated prior to July 31, 2001, disclosing improvement of a deposition chamber by including a piezoelectric vaporizer which include one or more piezoelectric grids. All masked dates in Exhibit A are prior to July 31, 2001. Confidential information not relevant to the invention date of the present application is also masked.
2. That Exhibit A describes an injector/vaporizer coupled to a deposition chamber, wherein the injector/vaporizer includes one or more grids positioned in a liquid material inlet passage that is connected to a vaporization chamber, and the vaporizer was conceived prior to July 31, 2001.
3. In view of Exhibit A and the above statements, the invention of pending claims 1-26 was conceived prior to July 31, 2001, and filed with due diligence prior to July 31, 2001, to the filing of the patent application on November 21, 2001.

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4. The undersigned, Ted G. Yoshidome and Joel M. Huston, hereby declare that all statements made herein of our own knowledge are true and that these statements made on information and belief are believed to be true and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent resulting therefrom.

FEBRUARY 25, 2005

Date

2/25/05

Date

Ted G. Yoshidome
Ted G. YoshidomeJoel M. Huston
Joel M. Huston

BEST AVAILABLE COPY**INVENTION ALERT FORM**

ITION ALERT FORM

TO: Gaile Bailey M/S 2061
Extension: 32724

ALERT NO: 0005006
Date: Date

CIRCLE ONLY ONE FROM TOP ROW(REQUIRED FIELD):-

SELECT ONE OF THE FOLLOWING COST CENTERS: - REQUIRED FIELD								
IMPLANT/ BATCH 1077	CMP 1399	METAL 0881	IBSS 0676	CORE ENG 0793	CU WIRE 2492	AKT	APD	FET 3037
IMPLANT/ SWIFT 1755		SILICON 0916	SMO/GAS 1649	ATD 1301	AL WIRE 2492		CDSEM	MDR/ DSI 3047
SIGEN		DIELECTRIC/RIE 0521	SMO/PUMP 1651	EPS 2590	CORE PVD 2492		WF	
ORION 2471		DIELECTRIC/ICP 0521	WMO 2792	CSM 2810			DRSEM	
EPI/ SUBSTRATE 2470		CONDUCTOR ETCH 0894	PSI/EPIC 2442		WCVD/ TUNGSTEN 2492		GEMI	
SCP 2512		CHAMBER TECH 0894	SCALPEL		CORE MDVD 2492		ICT	
TPG/RTP 0584		COMMON ENG 1419	CONSILIUM 2199		ISM-SYS 2492		RT	
TPG/LPVD 0584			ETEC		ISM-BASE 2492		OSI	
TPG/GATE 0584					ISM SOFTWARE 2492		CTO	
TPG/OTHER 0584					HDFCVD 0281			
PMD 3082					BLANKET CVD 0166			
					CORE DCVD 2492			
					LOW K 2445			
					ELK 2445			
STI					Dual Dam			
CAP					CU			
GATE STACK-1498								

Please use separate attachments for any answers that don't fit on the form, especially for questions 3-8. If the answer to a question is "NONE", please write "NONE" rather than leaving the answer blank.

1. Title of Invention (please print clearly): MEMS (Microelectromechanical Systems) based Variable Grid Aperture Piezo Electric Vaporizer.

2. Inventors-Names only-(please print clearly and provide complete information at Section 9.)

Ted G. Yoshidome, Joel M. Huston

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3. Earliest dates and model names of all Applied products incorporating the invention which have been offered for sale or are expected to be offered for sale:

No dates nor models have been incorporated at this point. This is a prototype that requires development before it can be marketed.

4. If the invention has been demonstrated or described to persons other than Applied employees, for each disclosure please provide the earliest date, name of company, a brief description of what was disclosed and the purpose of the disclosure. Attach a copy of any related non-disclosure agreements:

No one outside Applied Materials at this point.

5. If future disclosures like those in Question #4 are expected to occur within the next 12 months, please provide the anticipated date, type of information to be disclosed, and purpose of the disclosure: NONE []

Vaporizer manufacturer such as STEC (distributor in the US is Horiba-STEC). Other MEMS manufacturing capable vendors may be approached. Concept disclosure for development and manufacturing feasibility anticipated to enable the upgrade to a better vaporizer to be used in our systems; date of anticipated disclosure to be decided upon the outcome of this IA.

6. Describe any other known designs or processes, whether actually implemented or merely proposed in a publication, which could be considered similar to your invention or which constitute the state-of-the-art improved upon by your invention: If described in a publication, attach a copy of same or provide a citation.

Applied Materials uses extensively a vaporizer called Injection Valve manufactured by STEC Inc. of Kyoto, Japan. Although its use is extensive, many problems have been observed especially in the repeatability areas as well as some fundamental shortcomings due to its design nature. Many manufacturers have vaporizers, however, at this time the state-of-the-art device is considered to be the Injection Valve.

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7. List each feature of the invention which you consider novel and non-obvious. Describe the advantages of each novel feature in comparison with the state-of-the-art approaches which are most similar to your invention:

The current invention improves two aspects of the Injection Valve.

1. The Injection Valve controls its vaporization rate by means of a piezoelectric valve that controls the diffusion rate of, in this case, the CVD liquid precursor that is pressurized. The diffusion rate is controlled by a gap that is formed between the outlet of a converging nozzle and the active (or moving) seat of the piezoelectric valve. After the precursor has become a mist by the diffusing effect of the nozzle, the thermal energy present in the vaporizer allows the liquid to complete its phase change to a vapor. This valve actuator with its combination of multiple mechanical layers and its rough approach to gap controls is the cause for variations among vaporizers and thus vaporization rates.

The current invention approaches the flow rate control problem by varying the aperture formed by a grid made of a piezoelectric material. The piezoelectric grid can appear in the as in Figure 1.

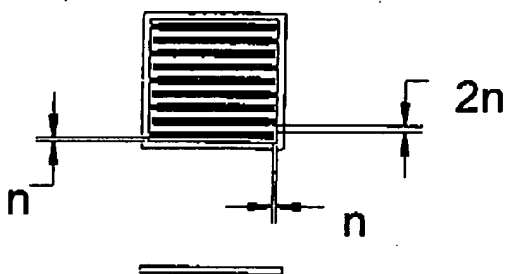


Figure 1 Piezoelectric material grid

An array of grids can be stacked so that each "piezoelectric arm" is perpendicular to each other as in Figure 2. This array will further provide control over the aperture spacing since the complement of the grids form discrete square sections as is shown in Figure 3.

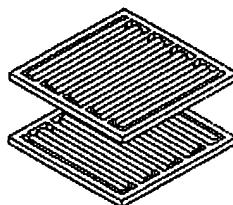


Figure 3 Array of Grids

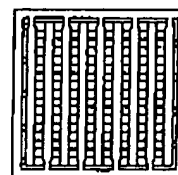


Figure 2 Top View of Grid Array

This Grid Array can be used to control the flow rate of the vaporizer as is shown in Figure 4.

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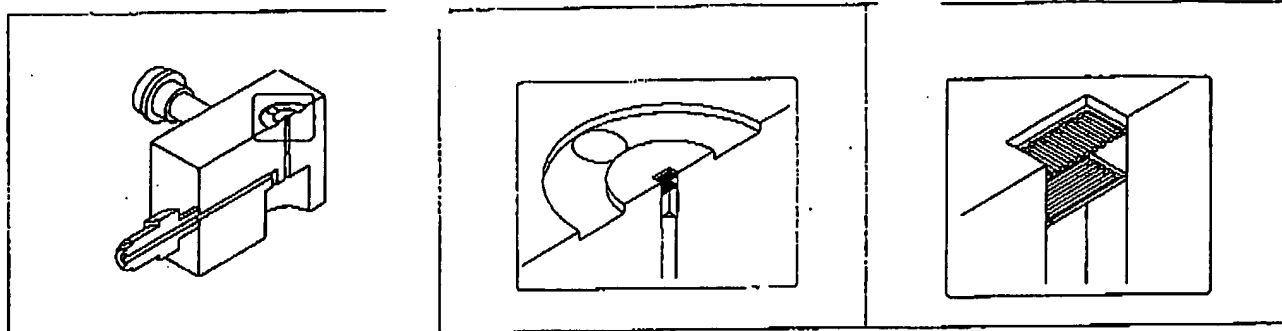


Figure 4 Proposed New Cross Section of an Injector Valve

This grid can be built using MEMS (Microelectromechanical Systems) technology due to its miniature size. Structural precautions have to be taken such as chemical precursor's high liquid pressure, precursor's chemical interaction with piezoelectric material, porosity of material, high temperature, etc. Also, the piezoelectric grid assembly must be able to withstand magnetic and electrical noise.

The second improvement in this invention eliminates the piezoelectric valve and can be substituted with a shut off valve. In the case of the MOCVD TiN application, where the process precursor is TDMAT, this feature allows isolation of the liquid source from the damaging effect from moisture (i.e. clogging). [Moisture reacts with TDMAT forming TiO_2 which eventually leads to clogging.]

8. Describe the invention, preferably with reference to attached drawings:

See explanation in question 7 of this IA.

ATTACH ADDITIONAL SHEETS TO DESCRIBE INVENTION AS NEEDED

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9. Provide the following information for EACH inventor:

Inventor #1:	
Legal Name: <u>Ted G. Yoshidome</u>	Employee #: <u>Confidential</u> Mail Stop <u>1107</u>
Work Phone: <u>Confidential</u>	Fax No.: <u>Confidential</u>
Job Title: <u>Mechanical Engineer</u>	
Citizenship: <u>Ecuador</u>	
Home Address: <u>5744 Presley Way, Oakland, CA 94618</u>	
Manager: <u>Michael Rosenstein</u>	Title: <u>Engineering Manager</u>
Div. Manager: <u>Mei Chang</u>	Title: <u>General Manager, Liner/Barrier Division</u>
Product Group: <u>Integrated Liner Barrier KPU</u>	Dept #: <u>278</u>

Inventor #2:	
Legal Name: <u>Joel M. Huston</u>	Employee #: <u>Confidential</u> Mail Stop <u>1107</u>
Work Phone: <u>Confidential</u>	Fax No.: <u>Confidential</u>
Job Title: <u>Mechanical Engineer</u>	
Citizenship: <u>U.S.A.</u>	
Home Address: <u>1090 Bird Avenue, #203, San Jose, CA 95125</u>	
Manager: <u>H. B. Teoh</u>	Title: <u>Engineering Manager</u>
Div. Manager: <u>Mei Chang</u>	Title: <u>General Manager, Liner/Barrier Division</u>
Product Group: <u>TiCl₄ Ti/TiN KPU</u>	Dept #: <u>2541</u>

Inventor #3:	
Legal Name: _____	Employee # _____ Mail Stop _____
Work Phone _____	Fax No: _____
Job Title: _____	
Citizenship: _____	
Home Address: _____	
Manager _____	Title: _____
Div. Manager _____	Title: _____
Product Group: _____	Dept #: _____

INVENTOR ALERT FORM

FOR ADDITIONAL INVENTORS, PLEASE COMPLETE AND ATTACH ADDITIONAL SHEET AS NEEDED.

ADDITIONAL INVENTORS:

Inventor # :	_____	Employee # _____	Mail Stop _____
Legal Name:	_____		
Work Phone	_____	Fax No.:	_____
Job Title:	_____		
Citizenship	_____		
Home Address	_____		
Manager:	_____	Title:	_____
Div. Manager	_____	Title:	_____
Product Group:	_____	Dept #:	_____

Inventor # :	_____	Employee # _____	Mail Stop _____
Legal Name:	_____		
Work Phone	_____	Fax No.:	_____
Job Title:	_____		
Citizenship:	_____		
Home Address	_____		
Manager:	_____	Title:	_____
Div. Manager	_____	Title:	_____
Product Group:	_____	Dept #:	_____

Inventor	_____	Employee # _____	Mail Stop _____
Legal Name:	_____		
Work Phone	_____	Fax No:	_____
Job Title:	_____		
Citizenship:	_____		
Home Address:	_____		
Manager	_____	Title:	_____
Div. Manager	_____	Title:	_____
Product Group:	_____	Dept #:	_____

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10. Signature, date and **PRINTED** name of each inventor plus two witnesses who have read and understood this Invention Alert form:

Inventors:

<u>TED G. YOSHIKOME</u>	<u>Date</u>	<u>Ted G. Yoshikome</u>
Printed Name	Date	Signature

<u>Joel M. Huston</u>	<u>Date</u>	<u>[Signature]</u>
Printed Name	Date	Signature

_____	_____	_____
Printed Name	Date	Signature

_____	_____	_____
Printed Name	Date	Signature

_____	_____	_____
Printed Name	Date	Signature

_____	_____	_____
Printed Name	Date	Signature

Witness:

<u>MICHAEL ROSENSTEIN</u>	<u>Date</u>	<u>[Signature]</u>
Printed Name	Date	Signature

<u>[Signature]</u>	<u>Date</u>	<u>[Signature]</u>
Printed Name	Date	Signature

_____	_____	_____
Printed Name	Date	Signature

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